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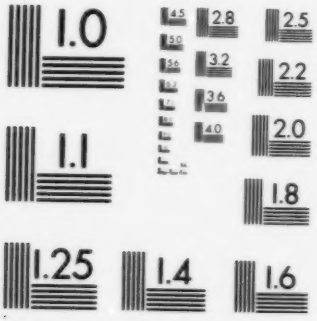

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Manitoba
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A BOTANICAL SURVEY OF THREE ECOLOGICAL RESERVES IN MANITOBA

B. L. Hathaway

July 31, 1984

Manuscript Report
84-22

Many thanks to Al Glasgow for his ideas
on what my report should be, and
to Horst Schell for doing
the illustrations.

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Summary of the 1984 Field Season

During the course of the summer, sampling was done at three of Manitoba's Ecological Reserves: Brokenhead River, Wampum Red Pine, and Pocock Lake. This sampling was designed to provide an indication of species composition, density, and distribution of plants on these reserves, which could be used to classify the communities occurring there. This data may also aide in determining the successional stages which these reserves are presently in.

At the three reserves I had hoped to use all of the transects established in 1981, but some had to be abandoned and re-established at Pocock Lake due to the tornado damage of 1982. I did not use any of Michelle's sampling techniques because I felt that there were other methods that would yield more useful data for the Committee.

At each reserve three strata were sampled: trees, shrubs, and herbs - with a different sampling technique used for each stratum.

I chose to use the quadrat technique to sample the herbs and shrubs because it is a fast, easy method to do in forests (a line-intercept technique is more suitable for open communities like bogs or grasslands). I used a 0.5 m x 0.5 m quadrat when sampling herbs, and I recorded cover by the Braun-Blanquet Scale and the frequency was determined later.

For the shrubs I used a 1 m x 2 m quadrat and I recorded density and frequency. Woody plants that were not herbs and did not have a circumference greater than 10 cm were considered to be shrubs.

The Point-Quarter technique was used to sample the trees at all sites. Only trees with a circumference greater than 10 cm were recorded, with this measurement being taken at breast height at all times. This technique and the calculations involved are described fully in the Appendix. If future summer student(s) have any problems understanding my methods I am sure that either Karen Johnson or Jennifer Shay could help.

Correct manipulation of the collected data will yield Importance Values (I.V.). An I.V. is a means by which any two or more species can be compared, regardless of where they are from. For example, Paper Birch (Betula papyrifera)has an I.V. of 41.33 at Wampum and one of 33.09 at Pocock Lake. Hence, B. papyrifera is more dominant at the Wampum Ecological Reserve. More importantly, I.V's can be used as a measure of successional change. If these areas are sampled repeatedly over the next few decades the order of dominance may change as succession advances. This summer's data showed that Oak seedlings (Quercus macrocarpa) are invading the riverbottom forest at Brokenhead. Many years from now these Oak may be the dominant tree species in that forest, but that change should be documented. I.V.'s are one way of accomplishing this task.

Brokenhead River Ecological Reserve

1. Methodology

The two transects used this summer were the ones established in 1981 (Fig. 1). Orange flagging tapes mark the ten locations of the Point-Quarter sampling points on both transects.

On transect 1 these points are all 30 paces apart, with the exception of the 60 paces between points 9 and 10. Five quadrats were done for the herbs at the beginning and end of this transect (Fig. 1). The shrubs were sampled with the same number of quadrats. The raw data for transect 1 is on pages 6 - 9 of the Appendix.

The Point-Quarter points on transect 2 are also 30 paces apart. Points 7 to 10 are located on the west side of the stream that passes through the reserve. A total of four quadrats were done for herbs and shrubs (two each) at every point east of the stream. The points that had been established beyond the stream in early June could not be found in July due to the dense understory. Hence, the quadrat sampling was done at random points. Five and six quadrats were recorded for shrubs and herbs respectively. The raw data for this transect is on pages 10-13 of the Appendix.

The two transects were treated as separate data bases because the Point-Quarter data revealed that there were two forest types on the reserve: Aspen (Populus tremuloides)* and Green Ash (Fraxinus pennsylvanica) (Tables 1 and 2).

2. Results

Aspen (Populus tremuloides) is the dominant tree species along the forest edge where transect 1 is located, but it does not occur in the inner forest (Tables 1,2). This may be due to differences in drainage, soil nutrients, or microclimate, but it is difficult to say for certain. Oak (Quercus macrocarpa) and Maple (Acer negundo) are much more dominant in the inner forest. Perhaps this is due to the low amount of disturbance along transect 2. The inner forest is also denser - there are 1323 trees per hectare along transect 2, while there are only 891 trees per hectare on transect 1 (Table 3).

The shrub data indicates that Oak seedlings (Quercus macrocarpa) are invading the peripheral forest in greater numbers, but they are not established as mature trees (Tables 4,5). Hazel (Corylus cornuta) is the dominant shrub throughout the reserve, but the greater diversity of shrubs is along transect 2.

There is a high amount of litter in this forest since it is the dominant "herb" on both transects (Tables 6,7). The two transects show similar dominant species such as Wild Ginger (Asarum canadense) and grasses, but the greater diversity is along transect 2 (Tables 6, 7).

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* Nomenclaure follows H. J. Scoggan, 1978

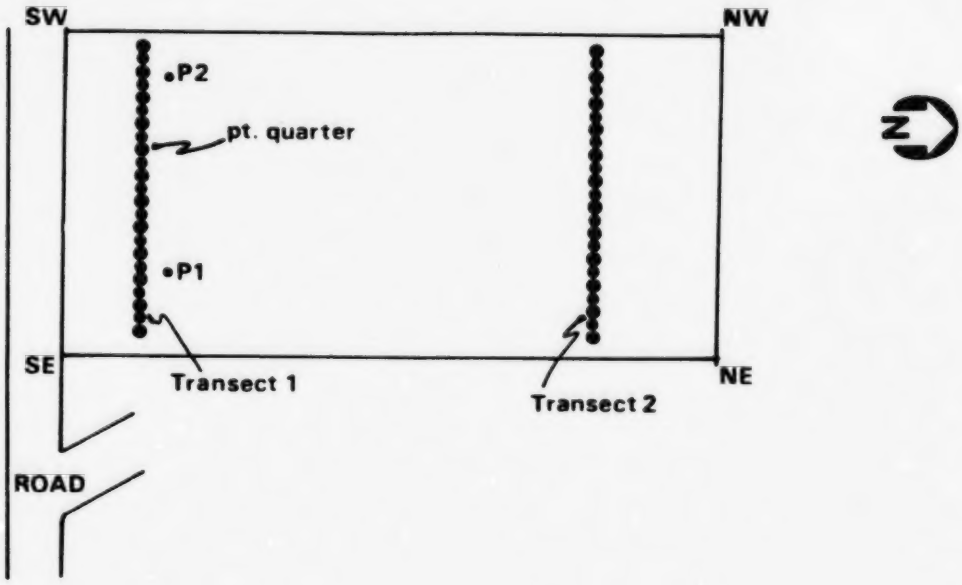

Fig. 1. Schematic drawing of the sampling routes at the Brokenhead River Ecological Reserve.

Table 2. Summary of the tree sampling done on the Brokenhead River Ecological Reserve (transect 2).

Species	No. of Trees	Total Basal Area	Relative Frequency	Relative Density	Relative Dominance	Importance Value
Fraxinus pennsylvanica	11	2278.55	32.14	27.50	16.37	76.01
Acer negundo	11	3031.27	25.0	27.50	21.77	74.27
Picea glauca	7	5263.24	10.71	17.50	37.81	66.02
Ulmus americana	7	2401.18	17.86	17.50	17.25	52.61
Quercus macrocarpa	3	372.27	10.71	7.50	2.67	20.88
Populus balsamifera	1	574.95	3.58	2.50	4.13	10.21
Σ	40	13921.46	100.0%	100.0%	100.0%	300.0

Table 3. Summary of density calculations for three of Manitoba's Ecological Reserves: Brokenhead River, Wampum Red Pine, and Pocock Lake.

Reserve	Mean Distance Between Trees (m)	Mean Area Per Tree (m^2)	Total Density Of All Species/ha.
Brokenhead River:			
Transect 1	3.35	11.22	891
Transect 2	2.75	7.56	1323
Wampum Red Pine	3.45	11.90	840
Pocock Lake:			
Lakeside	3.77	14.21	704
Hillside	4.85	23.52	425

Table 4

Summary of the shrub sampling done on the Brokenhead River Ecological Reserve (transect 1).

Species	Density	Relative Density (%)	Frequency	Relative Frequency (%)	I.V.
Corylus cornuta	33	27.97	0.90	21.95	49.92
Quercus macrocarpa	13	11.02	0.60	14.63	25.65
Fraxinus pennsylvanica	12	10.17	0.50	12.20	22.37
Prunus virginiana	12	10.17	0.40	9.76	19.93
Prunus pennsylvanica	13	11.02	0.20	4.88	15.90
Amelanchier alnifolia	10	8.47	0.30	7.32	15.79
Viburnum trilobum	9	7.63	0.30	7.32	15.26
Acer negundo	4	3.39	0.30	7.32	10.71
Apocynum androsaemifolium	6	5.08	0.20	4.88	9.96
Populus tremuloides	4	3.39	0.20	4.88	8.27
Rubus idaeus	1	0.85	0.10	2.44	3.29
Viburnum edule	1	0.85	0.10	2.44	3.29
Σ	118	100.01%	4.10	100.02%	200.04

Table 5. Summary of the shrub sampling done on the Brokenhead River Ecological Reserve (transect 2).

Species	Density	Relative Density (%)	Frequency	Relative Frequency (%)	I.V.
Corylus cornuta	41	24.85	0.47	15.36	40.21
Fraxinus pennsylvanica	13	7.88	0.40	13.07	20.95
Acer spicatum	22	13.33	0.20	6.54	19.87
Ulmus americana	14	8.48	0.27	8.82	17.30
Quercus macrocarpa	8	4.85	0.33	10.78	15.63
Acer negundo	8	4.85	0.33	10.78	15.63
Symphoricarpos albus	14	8.48	0.13	4.25	12.73
Viburnum trilobum	6	3.64	0.20	6.54	10.18
Rubus idaeus	9	5.45	0.13	4.25	9.70
Populus tremuloides	8	4.85	0.13	4.25	9.10
Acer spicatum	9	5.45	0.07	2.29	7.74
Prunus pennsylvanica	4	2.42	0.13	4.25	6.67
Rosa spp.	3	1.82	0.13	4.25	6.07
Crataegus rotundifolia	3	1.82	0.07	2.29	4.11
Amelanchier alnifolia	3	1.82	0.07	2.29	4.11
Σ	165	99.99%	3.06	100.01%	200.0

Table 6. Summary of the herb sampling done on the Brokenhead River Ecological Reserve (transect 1).

Species	Cover	Relative Cover (%)	Frequency	Relative Frequency (%)	I.V.
Litter	43.60	12.36	1.0	17.24	29.60
Asarum canadense	37.83	10.73	0.6	10.34	21.07
Grass	15.94	4.52	0.9	15.52	20.04
Smilacina stellata	31.0	8.79	0.6	10.34	19.13
Maianthemum canadense	20.58	5.83	0.6	10.34	16.17
Matteuccia struthiopteris	38.0	10.77	0.3	5.17	15.94
Galium boreale	38.0	10.77	0.2	3.45	14.22
Aquelegia canadensis	38.0	10.77	0.1	1.72	12.49
Trillium cernuum	18.50	5.25	0.3	5.17	10.42
Osmorhiza longistylis	8.75	2.48	0.4	6.90	9.38
Sanicula marilandica	15.0	4.25	0.2	3.45	7.70
Urtica dioica	15.0	4.25	0.1	1.72	5.98
Mentha spp.	15.0	4.25	0.1	1.72	5.98
Galium triflorum	8.75	2.48	0.2	3.45	5.93
Fragaria virginiana	8.75	2.48	0.2	3.45	5.93
$\sum$	352.70	99.98%	5.80	99.98%	199.98

Table 7. Summary of the herb sampling done on the Brokenhead River Ecological Reserve (transect 2).

Species	Cover	Relative Cover (%)	Frequency	Relative Frequency (%)	I.V.
Litter	24.94	3.61	0.85	15.32	18.93
Grasses	26.47	3.83	0.75	13.51	17.34
Osmorhiza longistylis	19.00	2.75	0.55	9.91	12.66
Asarum canadense	51.90	7.52	0.25	4.50	12.02
Pteridium aquilinum	66.00	9.56	0.10	1.80	11.36
Galium triflorum	24.25	3.51	0.40	7.21	10.72
Urtica urens	54.67	7.92	0.15	2.70	10.62
Thalictrum dasycarpum	66.00	9.56	0.05	0.90	10.46
Rhus radicans	20.58	2.98	0.30	5.41	8.39
Urtica dioica	24.20	3.50	0.25	4.50	8.00
Equisetum arvensis	35.33	5.12	0.15	2.70	7.82
Smilacina stellata	9.33	1.35	0.30	5.41	6.76
Trillium cernuum	13.60	1.97	0.25	4.50	6.47
Galium boreale	38.0	5.50	0.05	0.90	6.40
Smilax herbacea	38.0	5.50	0.05	0.90	6.40
Maianthemum canadense	13.0	1.88	0.25	4.50	6.38
Sanicula marilandica	22.67	3.28	0.15	2.70	5.98
Moss	22.67	3.28	0.15	2.70	5.98
Matteuccia struthiopteris	26.50	3.84	0.10	1.80	5.64
Fragaria virginiana	18.50	2.68	0.15	2.70	5.38
Mentha spp.	15.0	2.17	0.10	1.80	3.97
Petasites palmatus	15.0	2.17	0.05	0.90	3.07
Aquelegia canadensis	15.0	2.17	0.05	0.90	3.07
Menispermum canadense	15.0	2.17	0.05	0.90	3.07
Taraxacum officinalis	15.0	2.17	0.05	0.90	3.07
Σ	690.61	99.99%	5.55	99.97%	199.96

3. Discussion

A. Soil

In this region the soil is of one type: grey-black soil developed on medium-textured shallow lacustrine and flood plain deposits. It is uniformly distributed as loam to silty clay (Fig.2). Since the soil is uniform and of one type one would expect the vegetation to be similar throughout the area. This is not the case, however, and the species variation must be due to other environmental factors.

B. Community Classification

This reserve, based on its location in the province (Fig. 3), should be classified as mixed deciduous-coniferous forest, but the species composition more closely resembles that of the deciduous forest zone (Tables 8,9). On the mesic, moderately sloped land around transect 1 there is an Aspen (*Populus tremuloides*) - Bur Oak (*Quercus macrocarpa*) association. On the streamside soils by transect 2 there is a gallery forest consisting of Green Ash (*Fraxinus pennsylvanica*), Elm (*Ulmus americana*), and Manitoba Maple (*Acer negundo*). In moister regions there is a White Spruce (*Picea glauca*) association with the gallery forest.

Interestingly, there are three distinctive plant populations found on the reserve. One of these is a fern population (*Matteuccia struthiopteris*); the others are two populations of nettles (*Urtica dioica*, *Urtica urens*). All three populations are situated on the west side of the stream.

C. Disturbance

Cultivation of the adjacent field is one of the major sources of disturbance to the reserve. This year wheat has been planted there and some tends to spill over to the fringe of the reserve. Old trails (for logging, etc.) are the places where the weedy plant species from the fields invade. Thistles and wild oats are just two examples.

The road and hydro line on the southern edge of the reserve have also created some disturbance, but this is unavoidable.

Disturbance by animals is very minimal, based on the summer's observations. Occasionally a deer or rabbit was seen, but they did not appear to be trampling the reserve.

D. Suggestions

It would be interesting to see what kind of data would be produced if more transects were established between the ones there now. More sampling of all three strata should be done to get a more

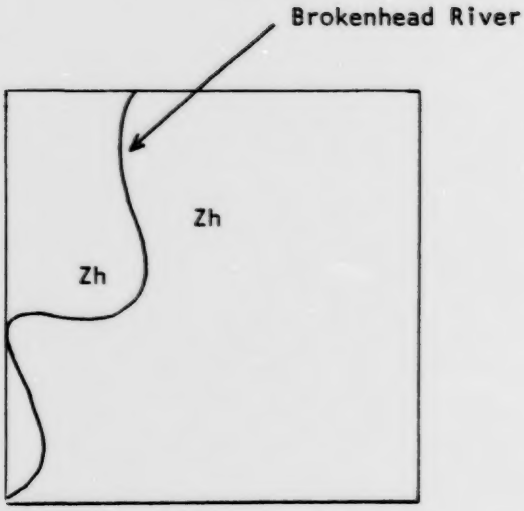

Fig. 2 Schematic drawing of the soil type on the Brokenhead River Ecological Reserve (SW 16-14-8E). "Zh" represents loam to silty clay (after Erlich etal, 1953).

Fig. 3. THE MAJOR VEGETATION ZONES OF MANITOBA

November, 1971

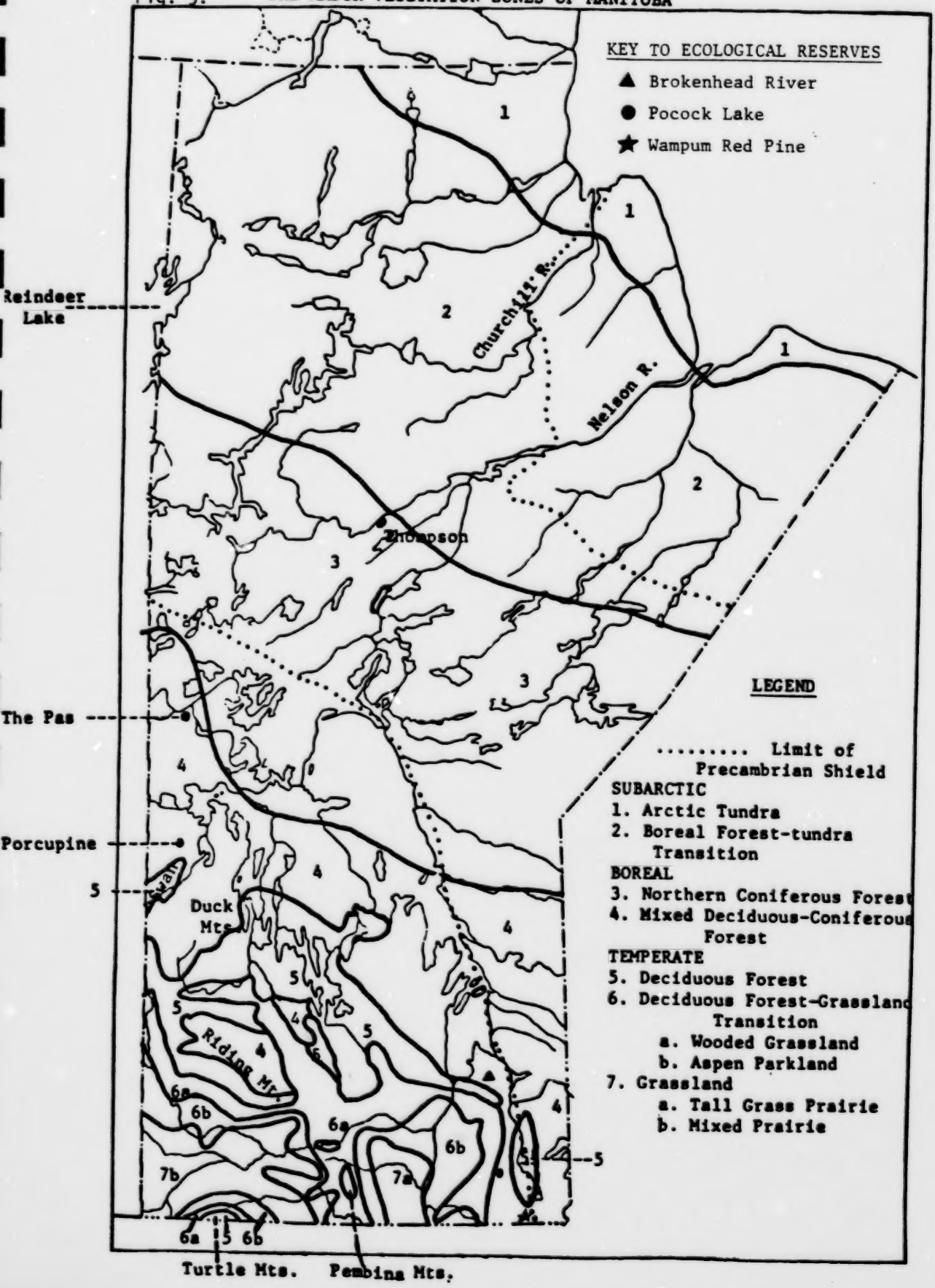

TABLE 8. MAJOR PLANT COMMUNITIES OF MANITOBA IN RELATION TO PHYSIOGRAPHY AND ECOCLIMATE (NORMAL FACIES)

MAJOR VEGETATION ZONES	SITE REGIONS	PHYSIOGRAPHY AND ECOCLIMATE		
		Warmer-drier (S. slopes; sand)	Normal-mesic (level; moderate slopes)	Cooler-wetter (N. slopes; bottomlands)
GRASSLANDS	Middle S. to S.W. corner of Manitoba	Mixed Grass Prairie (g-b^{1}-j grass	Tall Grass Prairie (b^{b}-i-j grass)	Fescue Prairie (Festuca-Danthonia)
DECIDUOUS FOREST-GRASSLAND TRANSITION	N. & E. of Grassland Zone (Aspen Parkland)	Prairie/ Bur Oak	Aspen-Bur Oak-$poplar^{b}$/Prairie	Aspen-$poplar^{b}$-Bur Oak
DECIDUOUS FOREST	Turtle Mt.; Riding Mt.; N.E. of Grassland transition	Bur Oak-Aspen ((jack pine))	Aspen-Bur Oak -Brokenhead River	Aspen-$poplar^{b}$-$birch^{w}$
MIXED DECIDUOUS-CONIFEROUS FOREST	Interlake Region & zone N.W. and S.E. of it	Aspen-$birch^{w}$/ ((jack pine))/ red & white pine -Wampum/Pocock L.	$Spruce^{w}$-aspen-fir^{b}-$birch^{w}$	$Spruce^{b}$-aspen-$birch^{w}$ -Pocock Lake
NORTHERN CONIFEROUS FOREST (BOREAL FOREST)	North and east of transition zone: mostly Canadian Shield	OPEN $Spruce^{w}$-fir^{b}-aspen ((jack pine))	$Spruce^{b}$-fir^{b}-mosses	$Spruce^{b}$-mosses
BOREAL FOREST-ARCTIC TUNDRA TRANSITION	Canadian Shield	$Spruce^{w}$-((jack pine))	OPEN $Spruce^{b}$-lichens	OPEN $Spruce^{b}$- lichen-moss
	Hudson Bay Lowlands	$Spruce^{w}$-((jack pine))	OPEN $Spruce^{b}$-lichen-mosses	$Spruce^{b}$-lichen-larch-mosses
ARCTIC TUNDRA	Canadian Shield	Heath Tundra - lichens - $Spruce^{b}$	Heath Tundra-lichens-$birch^{d}$	Willows- Heath tundra
	Hudson Bay Lowlands	Lichen Tundra	Lichen Tundra-Heath	Lichens-Moss tundra

- = associated species or groups of plants
/ = different communities in same region
((= successional communities

TABLE 9. MAJOR PLANT COMMUNITIES OF MANITOBA IN RELATION TO PHYSIOGRAPHY AND ECOCLIMATE (WET FACIES)

MAJOR VEGETATION ZONES	SITE REGIONS	PHYSIOGRAPHY AND DRAINAGE		
		Impeded Drainage (sloughs & kettles)	Good Drainage (lakeshores)	Streamside or Alluvium
GRASSLANDS	Middle S. to S.W. corner of Manitoba	Wet Prairie (c-b^{b}-pa grass)	Marsh (ph-t)	Gallery Forest (ash^{g}-elm^{w}-maple^{m})
DECIDUOUS FOREST-GRASSLAND TRANSITION	N. & E. of Grassland Zone (Aspen Parkland)	Wet Prairie/ Aspen	Marsh (ph-t)	Gallery Forest -Brokenhead River
DECIDUOUS FOREST	Turtle Mt.; Riding Mt.; N.W. of Grassland transition	Wet Prairie - willow	Marsh (ph-t)	Gallery Forest
MIXED DECIDUOUS-CONIFEROUS FOREST	Interlake Region & zone N.W. and S.E. of it	Spruce^{b}-larch muskeg -Pocock Lake	Sedge-rush meadow -Pocock Lake	Spruce^{w}-poplar^{b}
NORTHERN CONIFEROUS FOREST (BOREAL FOREST)	North & East of transition zone; mostly Canadian Shield	Spruce^{b}-larch-peat muskeg/ string & other bogs	Sedge-rush meadow	Spruce^{w}-alder
BOREAL FOREST-ARCTIC TUNDRA TRANSITION	Canadian Shield	Spruce^{b}-larch muskeg/palsa & string bogs (cottongrass)	Sedge Meadow	Spruce^{w}/willows-birch^{d}-alder
	Hudson Bay Lowlands	Lichen & Moss muskegs with spruce^{b} and larch/ heath and other bogs	Rush-grass meadow/ larch fen/willow-alder	Spruce^{w}-poplar^{b}/ Willow-birch^{d}-alder scrub
ARCTIC TUNDRA	Canadian Shield	Palsas/ heath & cottongrass bogs	Rush-sedge meadows	Spruce^{w}/willow-birch^{d}-alder scrub
	Hudson Bay Lowlands	Palsas/heath bogs	Sedge-grass meadow/ larch-birch^{d} fens/ willows	Willow-birch^{d}-alder scrub

- = associated species or groups of plants
/ = different communities in same region
((= successional communities

precise result.

Another factor that could be monitored in the future is the microclimate of the forest. Variables like temperature and humidity are easily recorded, and these recordings would help in analyzing the sampling data.

Wampum Red Pine Ecological Reserve

1. Methodology

The two transects established in 1981 were also used this year (Fig. 4). All of the points sampled were marked with orange flagging tape.

The points along transect 1 were marked in the following way:

point #1 - on SE part of trail; to the right
#2 - 30 paces from #1; right.
#3 - 23 paces from #2; right.
#4 - 30 paces from #3; left.
#5 - 15 paces from #4; right.
#6 - 15 paces from #5; left.
#7 - 30 paces from #6; left.
#8 - 15 paces from #7; right.
#9 - 15 paces from #8; right.
#10 - 30 paces from #9; right.
#11 - 30 paces from #10; left
#12 - 30 paces from #11; right.
#13 - 30 paces from #12; left.
#14 - 30 paces from #13; right.
#15 - #22 - 30 paces between points, all to the left.

All 22 points were used for Point-Quarter, but the herbs and shrubs were only sampled on the first 19 points.

The points on transect 2 were marked as follows:

point #1 - on western side of transect; to the left.
#2 - 30 paces from #1; right.
#3 - 30 paces from #2; right.
#4 - 30 paces from #3; left
#5 - 30 paces from #4; left.
#6 - 16 paces from #5; left
#7 - 22 paces from #6; right.
#8 - 30 paces from #7; left.
#9 - 30 paces from #8; left.
#10 - 30 paces from #9; left.
#11 - 36 paces from #10; left
#12 - 30 paces from #11; right.
#13 - 30 paces from #12; left.

All 13 points were used to sample the trees, shrubs, and herbs. Raw data for this reserve is on pages 14-20 of the Appendix.

The data obtained from these two transects was treated as a single data base because there were no significant species variation between the two.

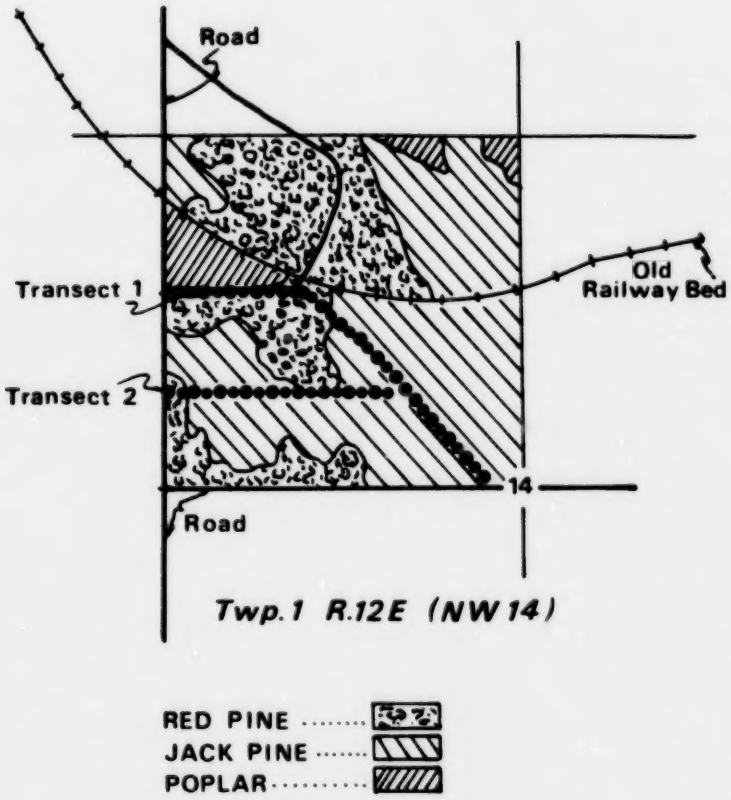

Fig. 4. Schematic drawing of the sampling routes at the Wampum Red Pine Ecological Reserve.

2. Results

The pines, by direct observation, are the obvious dominant tree species on this reserve. Jack Pine (Pinus banksiana), however, is more prevalent than Red Pine (Pinus resinosa) (Table 10). The forest density at Wampum is 840 trees per hectare (Table 3).

The shrub stratum on this reserve is quite diverse (Table 11). Hazel (Corylus cornuta) is clearly dominant, but other prevalent species are Blueberries (Vaccinium myrtilloides), Wood's Rose (Rosa acicularis) and Saskatoon (Amelanchier alnifolia).

At Wampum the greatest species diversity occurs in the herb stratum (Table 12). Litter is the most prevalent, but the dominant herbs are Bracken Fern (Pteridium aquilinum), Bearberry (Arctostaphylos uva-ursi), and two-leaved Solomon's Seal (Maianthemum canadense). Surprisingly, Sphagnum is quite abundant in this forest, despite the dry, sandy conditions.

3. Discussion

A. Soil

There are three soil types on the Wampum reserve: Sandilands Series; Woodridge Series; and the Carrick-Wassar Complex (Fig. 5). The Sandilands Series is sand that is stone-free, but with excessive natural drainage. The topography is flat to gently sloped.

The Woodridge Series has the same drainage pattern and topography, but it consists of calcareous, stratified sand and gravel deposits. Jack Pine (Pinus banksiana) is the characteristic vegetation of these two soil series.

Six to thirty feet of sand over strongly calcareous till composes the Carrick-Vassar Complex. This soil can be very stoney, but it has good natural drainage and a gently to moderately sloped topography. The characteristic vegetation of this soil is an Aspen (Populus tremuloides) - Birch (Betula papyrifera) - Jack Pine (Pinus banksiana) association.

B. Community Classification

Wampum can be correctly classified as a mixed deciduous-coniferous forest because of its location (Fig. 3). The entire reserve is dry and moderately sloped, and has the vegetation listed in Table 8.

C. Disturbance

A major source of disturbance to this reserve is campers. Towards the southeastern end of transect 1 there was evidence of two recent open fires. Further in there was a large pit filled with

Table 10

Summary of the tree sampling done on the Wampum Red Pine Ecological Reserve.

Species	No. of Trees	Total Basal Area CM^2	Relative Frequency (%)	Relative Density (%)	Relative Dominance (%)	Importance Value
Pinus banksiana	96	43842.27	53.56	68.57	65.56	187.69
Pinus resinosa	16	16195.4	12.50	11.43	24.22	48.15
Betula papyrifera	19	4229.08	21.44	13.57	6.32	41.33
Populus tremuloides	9	2604.39	12.50	6.43	3.90	22.83
Σ	140	66871.14	100.0%	100.0%	100.0%	300.0

Table 11. Summary of the shrub sampling done on the Wampum Red Pine Ecological Reserve.

Species	Density	Relative Density (%)	Frequency	Relative Frequency (%)	I.V.
Corylus cornuta	105	24.42	0.66	19.24	43.66
Vaccinium myrtilloides	88	20.47	0.47	13.70	34.17
Rosa acicularis	59	13.72	0.66	19.24	32.96
Amelanchier alnifolia	62	14.42	0.53	15.45	29.87
Lonicera glaucescens	58	13.49	0.28	8.16	21.13
Prunus virginiana	15	3.49	0.28	8.16	11.36
Rubus idaeus	12	2.79	0.16	4.66	7.28
Rubus pubescens	6	1.40	0.06	1.76	3.16
Alnus crispa	7	1.63	0.03	0.87	2.50
Viburnum trilobum	3	0.70	0.06	1.76	2.46
Populus tremuloides	3	0.70	0.06	1.76	2.47
Shepherdia canadense	3	0.70	0.03	0.87	1.57
Fraxinus nigra	3	0.70	0.03	0.87	1.57
Ribes spp.	2	0.47	0.03	0.87	1.34
Salix spp.	2	0.47	0.03	0.87	1.34
Crataegus rotundifolia	1	0.23	0.03	0.87	1.10
Pinus banksiana	1	0.23	0.03	0.87	1.10
Σ	430	100.03%	3.43	99.98%	199.03

Table 12. Summary of the herb sampling done on the Wampum Red Pine Ecological Reserve.

Species	Cover	Relative Cover (%)	Frequency	Relative Frequency (%)	I.V.
Litter	32.27	5.92	0.94	15.61	21.53
Pteridium aquilinum	55.46	10.18	0.41	6.81	16.99
Arctostaphylos uva-ursi	38.89	7.14	0.56	9.30	16.44
Maianthemum canadense	12.75	2.34	0.75	12.46	14.80
Sphagnum spp.	31.23	5.73	0.47	7.81	13.54
Fragaria virginiana	15.50	2.85	0.53	8.80	11.65
Grasses	8.97	1.65	0.59	9.80	11.45
Linnaea borealis	39.0	7.16	0.06	1.0	8.16
Aralia nudicaulis	27.80	5.10	0.16	2.66	7.76
Urtica dioica	38.0	6.98	0.03	0.50	7.48
Lathryus venosus	11.05	2.03	0.31	5.15	7.18
Smilacina stellata	21.83	4.01	0.19	3.16	7.17
Cladonia spp.	32.75	6.01	0.06	1.0	7.01
Cornus canadensis	26.50	4.87	0.06	1.0	5.87
Rhus radicans	19.00	3.49	0.13	2.16	5.65
Epilobium angustifolium	13.25	2.43	0.19	3.16	5.59
Sanicula marilandica	20.25	3.72	0.06	1.0	4.72
Gaultheria procumbens	7.50	1.38	0.16	2.66	4.04
Lycopodium complanatum	15.0	2.75	0.06	1.0	3.75
Pyrola asarifolia	10.17	1.87	0.09	1.50	3.37
Viola spp.	15.00	2.75	0.03	0.50	3.25
Moss	15.0	2.75	0.03	0.50	3.25
Anemone canadensis	15.0	2.75	0.03	0.50	3.25
Senecio canadensis	15.0	2.75	0.03	0.50	3.25
Senecio canus	2.50	0.46	0.03	0.50	0.96

Table 12 (cont'd).

Species	Cover	Relative Cover (%)	Frequency	Relative Frequency (%)	I.V.
Galium boreale	2.50	0.46	0.03	0.50	0.96
Campanula rotundifolia	2.50	0.46	0.03	0.50	0.96
Pyrola rotundifolia	2.50	0.46	0.03	0.50	0.96
Σ	544.67	99.99%	6.02	100.04%	200.03

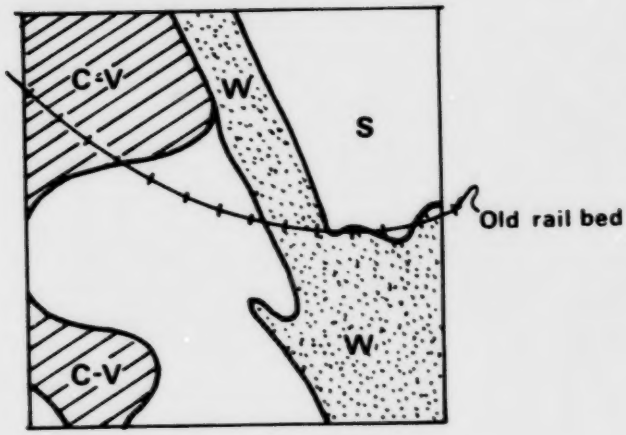

Fig. 5. Schematic drawing of the soil types on the Wampum Ecological Reserve (14-1-12E).

S represents the Sandilands Series, W is the Woodridge series, and C-V is the Carrick-Vassar Complex (after Smith and Erlich, 1964).

"new" garbage and empty shells, the evidence of a hunter or overnite guests. Other than this, the reserve is in a relatively undisturbed state.

Seven deer were sighted throughout the summer, in addition to black bears. There are no obvious animal trails on this reserve, so they pose a much smaller threat than the humans do.

D. Suggestions

If time and energy allows, there should be more sampling done at Wampum. A third transect could be established in the Red Pine stand north of the old rail bed. Temperatures and humidity recordings could also be taken to supplement the sampling data.

Perhaps there should also be a closer patrol of this reserve in order to curtail trespassers.

Pocock Lake Ecological Reserve

1. Methodology

No sampling was done on the west side of Pocock Lake this summer because of the tornado damage of 1982. Two other transects, T_1 and T_2 (to lake), also could not be relocated. These two plus a third transect, T_3, were re-established as illustrated in Figure 6. T_1 begins at the second twin marker on the road, and extends 105 paces up the hill. T_3 is approximately 50m north of the hillside portion of T_2, and extends 60 paces to the ridge.

Fourteen points were made on transect T_2 (to lake) for the Point-Quarter sampling. All points were 30 paces apart and are marked with orange flagging tape. The herbs and shrubs at these points were sampled in addition to the quadrats recorded in the sedge, shrub, and transition zones of the forest. In total, 19 quadrats were done for herbs and 15 were done for shrubs. The raw data for this transect is on pages 21-24 of the Appendix.

The number of points established on the hillside transects T_1, T_2, and T_3, were 7,8, and 5 respectively. The trees were sampled at all 20 points. The shrubs and herbs were sampled at 7 quadrats on both T_1 and T_2. The raw data for these hillside transects is on pages 25-28 of the Appendix.

The data from the lakeside and hillside transects was treated separately because this reserve is a good example of primary hydrarch succession (see discussion). The mesic and hydric forests differ from each other and the data emphasizes this difference.

2. Results

Cedar (*Thuja occidentalis*) is, by far, the most dominant tree species on the lakeside transect 2 (Table 13). Similarly, Jack Pine (*Pinus banksiana*) is clearly dominant on the hillside transects 1 - 3 (Table 14). The reserve, because of the differences in species composition of the two areas, can be divided into a hydric (Cedar) forest and a mesic (Jack Pine) forest.

Labrador Tea (*Ledum groenlandicum*), a characteristic shrub of bogs, is dominant on the lakeside transect (Table 15) while species characteristic of dryer communities dominate the hillside. Examples are the Canada Blueberry (*Vaccinium myrtilloides*), Wood's Rose (*Rosa acicularis*), and Saskatoon (*Amelanchier alnifolia*) (Table 16). The beaked Hazel (*Corylus cornuta*) is not as prevalent on this reserve as on the other two.

There is a large diversity of herbs at Pocock Lake, but the greatest diversity is on the lakeside transect (Tables 17, 18). *Sphagnum* and litter dominate the bog, although Bracken Fern (*Pteridium aquilinum*) is also prevalent. The hillside, however, is dominated by Bracken Fern, while the litter and grasses are prevalent.

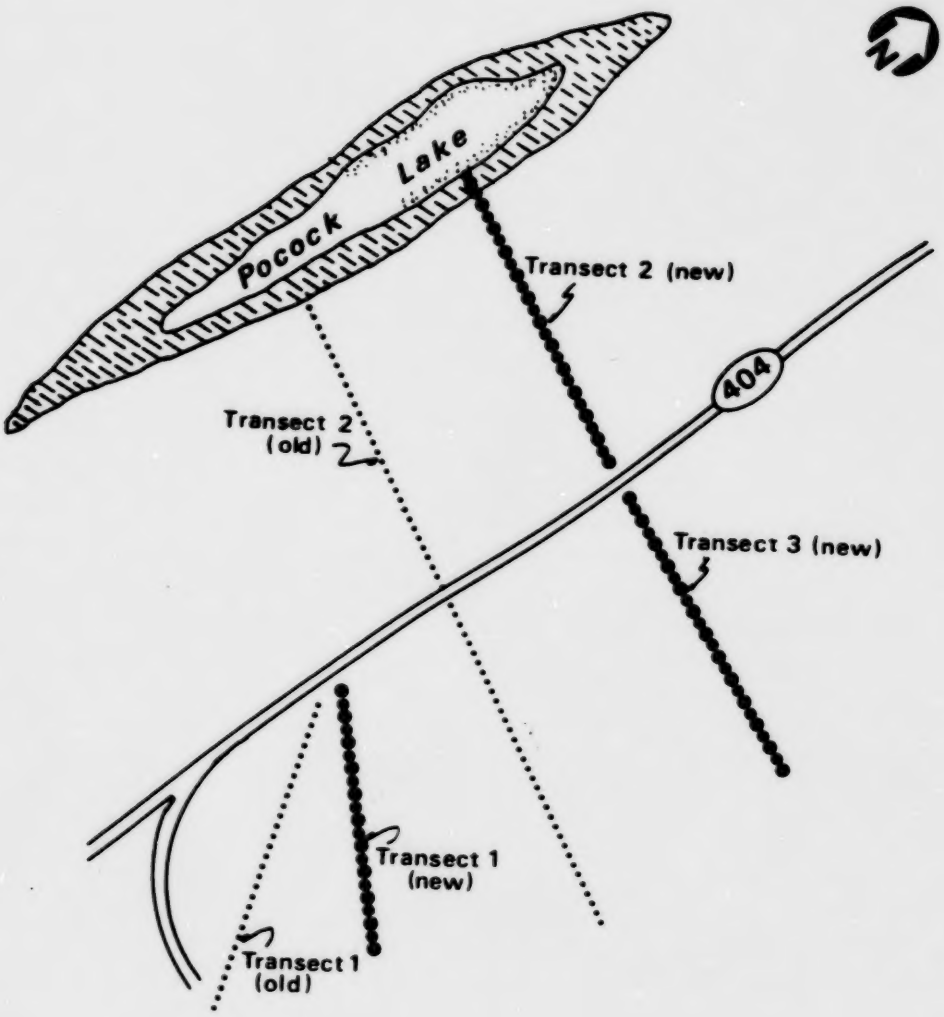

Fig. 6. Schematic drawing of the sampling routes at Pocock Lake Ecological Reserve.

Table 13. Summary of the tree sampling done on the Pocock Lake Ecological Reserve (transect 2, lakeside).

Species	No. of Trees	Total Basal Area cm^2	Relative Frequency (%)	Relative Density (%)	Relative Basal Area (%)	Importance Value
Thuja occidentalis	30	12324.57	48.31%	53.57%	66.08%	167.96
Picea mariana	14	2727.36	28.10	25.00	14.62	67.72
Betula papyrifera	7	2467.26	11.80	12.50	13.23	37.53
Larix laricina	3	303.50	3.93	5.36	1.63	10.92
Pinus banksiana	1	658.98	3.93	1.79	3.53	9.25
Picea glauca	1	168.39	3.93	1.79	0.90	6.62
Σ	56	18650.06	100.00%	100.01%	99.99%	300.00

Table 14. Summary of the tree sampling done on the Pocock Lake Ecological Reserve (transects 1-3, hillside).

Species	No. of Trees	Total Basal Area	Relative Frequency	Relative Density	Relative Basal Area	Importance Value
Pinus banksiana	71	24049.92	80.00	88.75	92.52	261.27
Betula papyrifera	8	1842.26	16.00	10.00	7.09	33.09
Populus tremuloides	1	103.13	4.00	1.25	0.40	5.65
Σ	80	25995.31	100.00%	100.00%	100.01%	300.01%

Table 15. Summary of the shrub sampling done on the Pocock Lake Ecological Reserve (transect 2, lakeside).

Species	Density	Relative Density (%)	Frequency	Relative Frequency (%)	I.V.
Ledum groenlandicum	137	51.31	0.73	24.25	75.56
Rubus pubescens	43	16.10	0.47	15.61	31.71
Thuja occidentalis	20	7.49	0.53	17.61	25.10
Corylus cornuta	13	4.87	0.47	15.61	20.48
Potentilla fruticosa	22	8.24	0.13	4.32	12.56
Amelanchier alnifolia	8	3.00	0.20	6.64	9.64
Acer spicatum	7	2.62	0.13	4.32	6.94
Alnus crispa	7	2.62	0.07	2.33	4.95
Salix spp.	6	2.25	0.07	2.33	4.58
Shepherdia canadense	2	0.75	0.07	2.33	3.08
Larix laricina	1	0.37	0.07	2.33	2.70
Rosa spp.	1	0.37	0.07	2.33	2.70
Σ	267	99.99%	3.01	100.01%	200.00

Table 16. Summary of the shrub sampling done on the Pocock Lake Ecological Reserve (transects 1-3, hillside).

Species	Density	Relative Density (%)	Frequency	Relative Frequency (%)	I.V.
Vaccinium myrtilloides	83	35.32	0.79	21.24	56.56
Rosa acicularis	32	13.62	0.57	15.32	28.94
Amelanchier alnifolia	35	14.89	0.43	11.56	26.45
Corylus cornuta	17	7.23	0.50	13.44	20.67
Lonicera diocia var. glaucescens	22	9.36	0.36	9.68	19.04
Prunus pennsylvanica	13	5.53	0.43	11.56	17.09
Ceanothus ovatus	13	5.53	0.29	7.80	13.33
Symphoricarpos albus	9	3.83	0.14	3.76	7.59
Viburnum trilobum	9	3.83	0.07	1.88	5.71
Pinus banksiana	1	0.43	0.07	1.88	2.31
Quercus macrocarpa	1	0.43	0.07	1.88	2.31
Σ	235	100.0%	3.72	100.0 %	200.0

Table 17. Summary of the herb sampling done on the Pocock Lake Ecological Reserve (transect 2, lakeside).

Species	Cover	Relative Cover (%)	Frequency	Relative Frequency (%)	I.V.
Sphagnum spp.	59.36	6.94	0.58	13.03	19.97
Litter	30.13	3.52	0.63	14.16	17.68
Pteridium aquilinum	77.0	9.01	0.11	2.47	11.48
Clintonia borealis	23.17	2.71	0.32	7.19	9.90
Cornus canadensis	9.64	1.13	0.37	8.31	9.44
Cypripedium reginae	47.33	5.54	0.16	3.60	9.14
Grasses	15.17	1.77	0.32	7.19	8.96
Caltha palustris	66.00	7.72	0.05	1.12	8.84
Aralia nudicaulis	66.00	7.72	0.05	1.12	8.84
Carex spp.	42.83	5.01	0.16	3.60	8.61
Matteuccia struthiopteris	34.0	3.98	0.16	3.60	7.58
Linnaea borealis	40.50	4.74	0.11	2.47	7.21
Petasites palmatus	38.00	4.45	0.11	2.47	6.92
Asarum canadense	38.00	4.45	0.11	2.47	6.92
Iris versicolor	26.50	3.10	0.11	2.47	5.57
Pyrola asarifolia	26.50	3.10	0.11	2.47	5.57
Smilax herbacea	38.0	4.45	0.05	1.12	5.57
Sanicula marilandica	38.0	4.45	0.05	1.12	5.57
Rhus radicans	15.0	1.75	0.11	2.47	4.22
Aquelegia canadense	15.0	1.75	0.11	2.47	4.22
Epilobium angustifolium	8.75	1.02	0.11	2.47	3.49

Table 17 (cont'd).

Species	Cover	Relative Cover (%)	Frequency	Relative Frequency (%)	I.V.
Asclepias incarnata	15.0	1.75	0.05	1.12	2.87
Cypripedium calceolus	15.0	1.75	0.05	1.12	2.87
Fragaria virginiana	15.0	1.75	0.05	1.12	2.87
Spiranthes romanzoffiana	15.0	1.75	0.05	1.12	2.87
Corallorhiza maculata	15.0	1.75	0.05	1.12	2.87
Mitella nuda	15.0	1.75	0.05	1.12	2.87
Trientalis borealis	2.50	0.29	0.11	2.47	2.76
Moneses uniflora	2.50	0.29	0.05	1.12	1.41
Galium boreale	2.50	0.29	0.05	1.12	1.41
Sisyrinchium montanum	2.50	0.29	0.05	1.12	1.41
Σ	854.88	99.97%	4.45	99.94%	199.91

Table 18. Summary of the herb sampling done on the Pocock Lake Ecological Reserve (transects 1-3, hillside).

Species	Cover	Relative Cover (%)	Frequency	Relative Frequency (%)	I.V.
Pteridium aquilinum	63.0	19.10	0.29	4.33	23.43
Litter	22.73	6.89	0.93	13.90	20.79
Grass	17.11	5.19	1.0	14.95	20.14
Arctostaphylos uva-ursi	20.86	6.33	0.71	10.61	16.94
Maianthemum canadense	17.72	5.37	0.64	9.57	14.94
Smilacina stellata	17.88	5.42	0.57	8.52	13.94
Rhus radicans	38.0	11.52	0.07	1.05	12.57
Thalictrum dasycarpum	26.50	8.04	0.14	2.09	10.13
Apocynum androsaemifolium	22.67	6.88	0.21	3.14	10.02
Galium boreale	10.83	3.28	0.43	6.43	9.71
Lathryns venosus	15.0	4.55	0.21	3.14	7.69
Campanula rotundifolia	8.75	2.65	0.29	4.33	6.98
Anemone cylindrica	8.75	2.65	0.29	4.33	6.98
Sanicula marilandica	15.0	4.55	0.14	2.09	6.64
Cladonia spp.	10.83	3.28	0.21	3.14	6.42
Sphagnum spp.	6.67	2.02	0.21	3.14	5.16
Gaultheria procumbens	2.50	0.76	0.14	2.09	2.85
Fragaria virginiana	2.50	0.76	0.14	2.09	2.85
Asarum canadense	2.50	0.76	0.07	1.05	1.81
Σ	329.80	100.00%	6.69	99.99%	199.99

3. Discussion

A. Soil

There are four soil types on this reserve: Woodridge Series; Sandilands Series; Lonesand-Kerry Complex; and Deep Peat (Fig. 7). The Woodridge Series consists of calcareous, stratified sand and gravel deposits, and can be slightly stoney. This series has irregular topography (ie. gently to moderately sloped) and excessive natural drainage. Jack Pine (*Pinus banksiana*) is the characteristic vegetation of this soil.

The Lonesand-Kerry Complex is composed of aeolian and outwash sand deposits. It also has irregular topography, but with poor drainage. Aspen (*Populus tremuloides*), Balsam Poplar (*Populus balsamifera*), Jack Pine (*Pinus banksiana*), Willow (*Salix* spp.) and sedges (*Carex* spp.) are frequently found on this soil type.

Deep Peat refers to a layer of stone-free peat over 36 inches thick that is found on depressional to level topography. This soil is subject to very poor natural drainage, as evidenced by the water pools in the *Sphagnum* mat at Pocock Lake. Characteristic plant species of this soil type are sedges (*Carex spp.*), reeds, Tamarack (*Larix laricina*), Black Spruce (*Picea mariana*) and Cedar (*Thuja occidentalis*).

The Sandilands Series consists of sand on irregular topography. It has excessive natural drainage and its characteristic vegetation is Jack Pine (*Pinus banksiana*).

B. Community Classification

Of the three reserves in Manitoba, this one has the greatest community diversity. Pocock Lake has the widest range of physiography and ecoclimate. It can be classified as a mixed deciduous-coniferous forest (Fig. 3) (Tables 8,9).

There is one distinctive population found within the reserve. It is a Showy Lady's Slipper (*Cypripedium reginae*) population situated in the Cedar (*Thuja occidentalis*) stand.

C. Succession

As stated before, this reserve is an excellent example of primary hydrarch succession. This type of succession is defined as the filling in of a lake (Barbour *et al*, 1980). The pioneer stage of this type of succession is characterized by aquatic plants

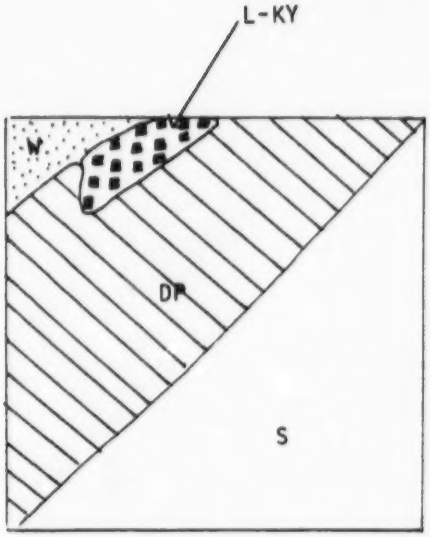

Fig. 7. Schematic drawing of soil types on the Pocock Lake Ecological Reserve (E½ 27-5-9E). W represents the Woodridge Series, L-KY is the Lonesand-Kerry Complex, DP is deep peat, and S is the Sandilands Series (after Smith and Erhlich, 1964).

such as Water Lilies (Nuphar variegatum) and emergents such as cattails (Typha latifolia) (Fig. 8). Eventually a sedge (Carex spp.) mat forms and shrubs such as Swamp Birch (Betula glandulosa) and Shrubby Cinquefoil (Potentilla fruticosa) invade. As the vegetation dies a peat layer forms, and trees such as Tamarack (Larix laricina), Black Spruce (Picea mariana) and Cedar (Thuja occidentalis) become established. Sphagnum and associated herbs soon form a thick forest floor. The drainage is poor here and the area is classified as a bog. If the topography becomes steeper and the drainage improves, then the climax vegetation will become apparent. At Pocock Lake the climax stage is represented by the mature Jack Pine (Pinus banksiana) stand on the hillside.

D. Disturbance

The Pocock Lake Reserve is relatively undisturbed. A few cut Birch trees were seen this summer, but they may not have been cut down in the recent past.

There is a trail that runs parallel to the lake and it appears to be frequently used by deer or moose. There is a noticeable lack of vegetation by this trail, but this may be due to the presence of the Cedars or the poor drainage.

E. Suggestions

Again, there should be more transects established on this reserve in order to produce better results. Ideally, the reserve could be separated into three study areas: sedge mat-shrub zone, hydric forest, and mesic forest. Measurement of the microclimate would be a helpful supplement to the sampling data.

It would also be interesting to re-establish the transect on the western shore of Pocock Lake. That Jack Pine forest may differ slightly from the one east of Provincial Road 404, due to the soil differences.

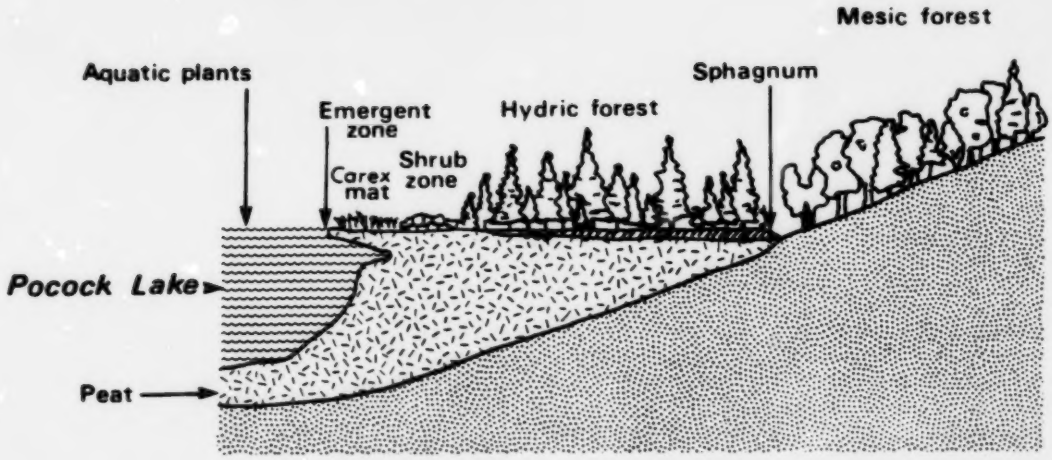

Fig. 8. Schematic drawing of primary hydrarch succession at Pocock Lake Ecological Reserve (after Barbour et al, 1980).

Conclusions

Although these three reserves lie within the same vegetation zone (mixed deciduous - coniferous forest), they are very different from one another. Brokenhead is characterized by a gallery deciduous forest and an aspen-oak association, while Wampum is characterized by a Jack Pine - Red Pine forest. Pocock Lake features several communities, including bog, Cedar forest, and Jack Pine forest.

Similar plant species are found at all three reserves, but they are not always in the same combination. This is due mostly to the different physiography, ecoclimate, and soil at each ecological reserve.

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Erhlich, W. A., E. A. Poyer, L. E. Pratt, and J. H. Ellis. 1953. Report of reconnaissance soil survey of Winnipeg and Morris map sheet areas. Manitoba Dept. of Agriculture. Report #5.

Smith, R. E. and W. A. Erhlich. 1964. Soil survey of the southeastern map sheet area. Manitoba Dept. of Agriculture and Conservation. Report #14.

Nomenclature follows H. J. Scoggan, The Flora of Canada, 1978.

APPENDIX

QUADRAT SAMPLING

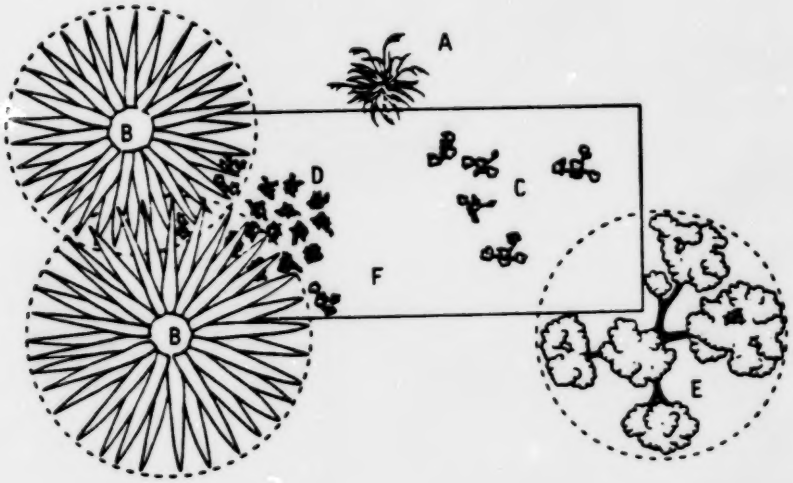
Square, rectangular, or round quadrats can be used to sample plant communities. On the Ecological Reserves square quadrats were used for the herbaceous stratum and rectangular quadrats for the shrubs.

Cover is the percentage of quadrat area occupied by a species. For each species in a quadrat cover is determined according to the Braun-Blanquet (1932) Scale:

Cover

1 covering less than 5%
2 covering 5 - 25%
3 covering 26 - 50%
4 covering 51 - 75%
5 covering 76 - 100%

The only herbs which are sampled are those that are rooted inside the quadrat.



In the above diagram species A, B and E are not rooted inside the quadrat and are not recorded. Species C occupies about 20% of the quadrat and is assigned a "2" for cover. Species D rates a "3" and Species F (litter or bare ground) is given a "4".

Relative Cover is the cover of any species expressed as a percentage of total plant cover. These values always total to 100%.

Density is the number of plants rooted within a quadrat. Shrub density is determined by counting the number of stems of each species within each quadrat.

Relative Density is the density of one species as a percent of the total plant density. Again, these values sum to 100%.

Frequency is the percentage of total quadrats in which a particular species occurs. If species x occurs in 7 quadrats out of 15, then its frequency is 0.47, or 45%.

Relative Frequency is the frequency of any given species as a percentage of total plant frequency. These values sum to 100%.

An *Importance Value* is defined as

I.V. = RELATIVE COVER + RELATIVE DENSITY + RELATIVE FREQUENCY

and totals 300. If only two of the variables are used then the I.V.'s will sum to 200.

SUGGESTED READING

Barbour, M. G., J. H. Burk, and W. D. Pitts. 1980.
Terrestrial plant ecology. The Benjamin/Cummings Publishing Company, Inc., U.S.A.

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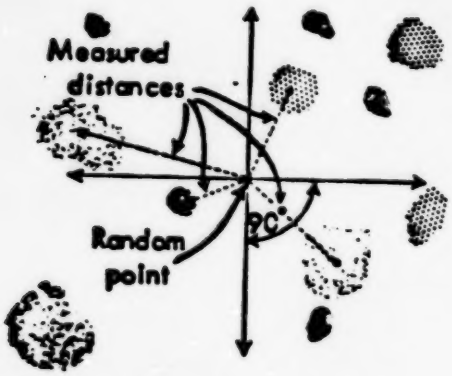
POINT QUARTER METHOD

A series of points is chosen by an objective procedure. In the Ox Bow Wood you should lay out a 50 m tape and locate points every 10 or 20 m along the transect thus set up. The distance between points should be such that the same individual tree is not recorded at successive points. Repeat until 20 points have been sampled.

At each point the space around the point is divided into four quarters or quadrants with the tape as one bisect and a line perpendicular to the tape as the second. The individual tree nearest to the point in each quadrant is then located. For each of the four trees per point record the species name, the distance from the center of the trunk to the point, and the circumference at breast height. The circumference measurements can be converted to areas using the table provided.



RESTRICTIONS AND PROBLEMS

1. Environmental Stresses such as nutrient deficiency, drought, etc. can cause trees to clone or grow crookedly. Such stems are counted as one, with the circumference and distance being measured from the stem nearest the center of the quadrants.

2. Deep snow sometimes flattens trees, but the circumference and distance measurements are taken at breast height anyway.

3. Trees that are less than 10 cm in circumference are not included in the sample because they are considered to be shrubs.

Point Quarter Method Calculations

Density

1. Mean distance = $\frac{\text{total of all point to tree distances in meters}}{\text{number of points} \times 4}$

2. Mean area occupied per tree (all species) = mean distance squared

3. Total density all species = $\frac{10{,}000}{\text{Mean Area}}$ trees per hectare (10,000 m^2 = 1 hectare)

4. Relative density of species A = $\frac{\text{number of individuals of species A}}{\text{number of individuals of all species}} \times 100$

5. Absolute density species A = $\frac{\text{relative density species A} \times \text{total density all sp.}}{100}$

Basal Area

1. Total basal area of all species = total area occupied by tree trunks at breast height

   This can be determined from circumference data and the conversion table provided.

2. Mean basal area per tree (all species) = $\frac{\text{total basal area}}{\text{number of trees}}$

3. Total basal area of all species per hectare = Mean basal area per tree x total density of trees per hectare

4. Relative basal area of species A = $\frac{\text{total basal area of species A}}{\text{total basal area of all species}} \times 100$

5. Absolute basal area of species A per hectare =

   $$\frac{\text{relative basal area of species A} \times \text{total basal area of all species per hectare}}{100}$$

Importance Values

1. For each species:

   I.V. = RELATIVE DENSITY + RELATIVE BASAL AREA + RELATIVE FREQUENCY
   (%) (%) (%)

2. Importance values of all plant species sum to 300.

Conversion of Circumference Measurements to Circular Area Values.

Circ.	Area	Circ.	Area	Circ.	Area	Circ.	Area
1	0.10	46	168.39	91	658.98	136	1471.87
2	0.32	47	175.79	92	673.56	137	1493.58
3	0.94	48	183.35	93	688.26	138	1515.47
4	1.68	49	191.06	94	703.17	139	1537.52
5	1.99	50	198.94	95	718.18	140	1559.72
6	2.86	51	206.98	96	733.41	141	1582.08
7	3.90	52	215.15	97	748.74	142	1604.60
8	5.09	53	223.53	98	764.28	143	1627.28
9	6.44	54	232.05	99	779.94	144	1650.12
10	7.96	55	240.72	100	795.80	145	1673.12
11	9.63	56	249.55	101	811.77	146	1696.27
12	11.46	57	258.55	102	827.95	147	1719.59
13	13.45	58	267.70	103	844.24	148	1743.07
14	15.60	59	277.02	104	860.74	149	1766.70
15	17.90	60	286.48	105	877.34	150	1790.50
16	20.37	61	296.11	106	894.16	151	1814.44
17	23.00	62	305.90	107	911.08	152	1838.56
18	25.78	63	315.69	108	928.21	153	1862.83
19	28.73	64	325.95	109	945.46	154	1887.26
20	31.83	65	336.21	110	962.92	155	1911.84
21	35.27	66	346.64	111	980.47	156	1936.60
22	38.51	67	357.23	112	998.25	157	1961.52
23	42.10	68	367.98	113	1016.12	158	1986.57
24	45.84	69	378.88	114	1034.22	159	2011.81
25	49.74	70	389.93	115	1052.41	160	2037.18
26	53.79	71	401.16	116	1070.83	161	2062.73
27	58.01	72	412.54	117	1089.33	162	2088.43
28	62.39	73	424.08	118	1108.07	163	2114.30
29	66.92	74	435.78	119	1126.89	164	2140.31
30	71.62	75	447.64	120	1145.95	165	2166.50
31	76.47	76	459.65	121	1165.10	166	2192.83
32	81.49	77	471.83	122	1184.43	167	2219.34
33	86.66	78	484.16	123	1203.93	168	2245.99
34	91.99	79	494.66	124	1223.58	169	2272.81
35	97.48	80	509.31	125	1243.40	170	2299.80
36	103.13	81	522.11	126	1263.37	171	2326.92
37	108.94	82	535.08	127	1283.51	172	2354.23
38	114.90	83	548.21	128	1303.79	173	2381.67
39	121.04	84	561.50	129	1324.25	174	2409.29
40	127.48	85	574.95	130	1344.86	175	2437.06
41	133.77	86	588.57	131	1365.63	176	2464.99
42	140.37	87	602.32	132	1386.56	177	2493.08
43	157.14	88	616.27	133	1407.64	178	2521.33
44	154.06	89	630.33	134	1428.90	179	2549.75
45	161.14	90	644.60	135	1450.30	180	2578.31

Summary of the 1984 Field Season

During the course of the summer, sampling was done at three of Manitoba's Ecological Reserves: Brokenhead River, Wampum Red Pine, and Pocock Lake. This sampling was designed to provide an indication of species composition, density, and distribution of plants on these reserves, which could be used to classify the communities occurring there. This data may also aide in determining the successional stages which these reserves are presently in.

At the three reserves I had hoped to use all of the transects established in 1981, but some had to be abandoned and re-established at Pocock Lake due to the tornado damage of 1982. I did not use any of Michelle's sampling techniques because I felt that there were other methods that would yield more useful data for the Committee.

At each reserve three strata were sampled: trees, shrubs, and herbs - with a different sampling technique used for each stratum.

I chose to use the quadrat technique to sample the herbs and shrubs because it is a fast, easy method to do in forests (a line-intercept technique is more suitable for open communities like bogs or grasslands). I used a 0.5 m x 0.5 m quadrat when sampling herbs, and I recorded cover by the Braun-Blanquet Scale and the frequency was determined later.

For the shrubs I used a 1 m x 2 m quadrat and I recorded density and frequency. Woody plants that were not herbs and did not have a circumference greater than 10 cm were considered to be shrubs.

The Point-Quarter technique was used to sample the trees at all sites. Only trees with a circumference greater than 10 cm were recorded, with this measurement being taken at breast height at all times. This technique and the calculations involved are described fully in the Appendix. If future summer student(s) have any problems understanding my methods I am sure that either Karen Johnson or Jennifer Shay could help.

Correct manipulation of the collected data will yield Importance Values (I.V.). An I.V. is a means by which any two or more species can be compared, regardless of where they are from. For example, Paper Birch (Betula papyrifera)has an I.V. of 41.33 at Wampum and one of 33.09 at Pocock Lake. Hence, B. papyrifera is more dominant at the Wampum Ecological Reserve. More importantly, I.V's can be used as a measure of successional change. If these areas are sampled repeatedly over the next few decades the order of dominance may change as succession advances. This summer's data showed that Oak seedlings (Quercus macrocarpa) are invading the riverbottom forest at Brokenhead. Many years from now these Oak may be the dominant tree species in that forest, but that change should be documented. I.V.'s are one way of accomplishing this task.

Quadrat Sheet

Observer: BEV HATHAWAY

Date: JUNE 5 1984

Place: BROKENHEAD ECOLOGICAL RESERVE

Vegetation: RIVER BOTTOM FOREST

Size and shape of quadrat: 0.5m x 0.5m

Notes: eg. technique (cover, presence etc) HERBS (T_1)

Species	Number of Quadrat																				
	P_1					P_2															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
~~Bare ground~~																					
LITTER	5	3	4	3	2	4	3	4	2	2											
Smilacina stellata	2	4	2		2	2	4														
Galium trifolium	2				1																
Maianthemum canadense	2	2				3	3	2	1												
GRASS	1	1	1		4	1	1	3	2	2											
Osmorhiza longistylis	2							1	1	2											
Fragaria virginiana		1			2																
Matteuccia struthiopteris			3			3			3												
Asarum canadense			2	3	3			2	4	5											
Mentha spp.			2																		
Trillium cernuum				1		3	2														
Sanicula marilandica							2	2													
Urtica dioica								2													
Galium boreale									3	3											
Aquilegia canadensis										3											

Quadrat Sheet

Observer: BEV HATHAWAY

Vegetation: RIVER BOTTOM FOREST

Date: JUNE 5, 1984

Size and shape of quadrat: 1m x 2m

Place: BROKENHEAD ECOLOGICAL RESERVE

Notes: eg. technique (cover, presence etc) SHRUBS (T_1)

Species	Number of Quadrat P_1					P_2															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
~~Bare ground~~																					
Rubus idaeus	1																				
Corylus cornuta	4		2	4	3	7	5	3	1	7											
Fraxinus pennsylvanica	1	2	4	1			4														
Populus tremuloides		3		1																	
Prunus virginiana		4		1	1	6															
Viburnum trilobum		2	3						4												
Quercus macrocarpa			5	2	4	4		2	1												
Acer negundo			1		2		1														
Amelanchier alnifolia						3		5	2												
Viburnum edule							1														
Apocynum androsaemifolium								4	2												
Prunus pennsylvanica									3	10											

POINT QUARTER RECORD SHEET

Surveying Team- Ross Thomasson, Bev Hathaway

Site- Broken Head Reserve (T_1)

Date- June 4, 1984

Soil Type-

Soil pH-

Conductivity-

Point		Tree species	(m.) Dist.	(cm.) circum.
1	UR	Picea glauca	6.8 m	110 cm
	LR	Fraxinus pennsylvanica	7.5	76
	LL	Populus tremuloides	3.9	84
	UL	F. pennsylvanica	4.3	40
2		Ulmus americana	10.8	80
		F. pennsylvanica	2.2	83
		F. pennsylvanica	2.7	72
		U. americana	4.0	60
3		P. tremuloides	4.5	50
		P. tremuloides	4.6	54
		Acer negundo	1.5	36
		P. tremuloides	1.7	36
4		P. tremuloides	2.0	37
		P. tremuloides	4.4	41
		P. tremuloides	1.5	27
		P. tremuloides	1.5	41
5		P. tremuloides	4.6	30
		P. tremuloides	9.45	23
		F. pennsylvanica	1.7	67
		P. tremuloides	2.1	32
6		P. tremuloides	3.2	54
		P. tremuloides	2.85	26
		Acer negundo	0.46	23
		P. tremuloides	2.25	40
7		P. tremuloides	2.9	47
		P. tremuloides	4.64	51
		P. tremuloides	4.2	45
		P. tremuloides	3.15	22
8		P. tremuloides	2.28	55
		P. tremuloides	4.98	51
		P. tremuloides	0.80	18
		P. tremuloides	0.65	53

team very low

60 paces between 9 ↑ ↓ 10

Point	Tree species	(m.) Dist.	(cm.) circum.
9	P. tremuloides	1.0 m	36 cm
	P. tremuloides	2.15	53
	P. tremuloides	1.65	43
	F. pennsylvanica	4.1	15
	F. pennsylvanica	1.25	15
10	Quercus macrocarpa	2.2	36
	P. tremuloides	2.8	44
	F. pennsylvanica	4.6	36
11			
12			
13			
14			
15			
16			

Quadrat Sheet

Observer: BEV HATHAWAY ROSS THOMASSON

Vegetation: HERBS (T_2)

Date: JULY 12/84

Size and shape of quadrat $0.25 m^2$

Place: BROKENHEAD ECOLOGICAL RESERVE

Notes: eg. technique (cover, presence etc)

Species	Number of Quadrat																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
~~Bare ground~~ LITTER	4	5	4	2	2	3	1	1	2	3	3	2	2	1	1		1			1	
Pteridium aquilinum	4						4														
Moss	2		3				2														
GRASSES	2	1			2	4	2	3	1			2	1	3	3	2		1	4	4	
Smilacina stellata	1	1	1	1						3										3	
Fragaria virginiana		2	1	3																	
Maianthemum canadense		2	2	1			2							2							
Trillium cernuum			2		2										2				3	2	
Osmahiza longistylis			2	3	1		3	3	2			2	2	2			2		1		
Rhus radicans			1	2		3						3				2	2				
Sanicula marilandica				2													2			3	
Asarum canadense					5			1	5	2			4								
Aquilegia canadense						2															
Galium triflorum							2	4	2	3			2	2		2				2	
Urtica dioica								2							3	3		2		2	
Urtica urens								3		3	5										
Mentha spp.										2	2										
Menispermum canadense											2										
Smilax herbacea												3									
Petasites palmatus												2									
Taraxacum officinalis													2								
Thalictrum dasycarpum														4							
Galium boreale															3						

Quadrat Sheet

Observer: _____

Date: _____

Place: BROKENHEAD ECOLOGICAL RESERVE

Vegetation: Herbs (T_2) - cont'd.

Size and shape of quadrat _____

Notes: eg. technique (cover, presence etc)

Species	Number of Quadrat																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
~~Bare ground~~																					
Equisetum arvense																	4	3	1		
Matteuccia struthiopteris																	2	3			

POINT QUARTER RECORD SHEET

Surveying Team- BEV HATHAWAY, ROSS THOMASSON

Site- BROKENHEAD RESERVE (T2)

Date- JUNE 4/84

Soil Type-

Soil pH-

Conductivity-

Point	Tree species	(m.) Dist.	(cm.) circum.	Point	Tree species	(m.) Dist.	(cm.) circum.
1	Acer negundo	0.8 m	22 cm	right 9	Acer negundo	2.2	56
	Q. macrocarpa	3.3	57		Acer negundo	3.32	15
	F. pennsylvanica	2.7	33		F. pennsylvanica	2.36	13
	Acer negundo	1.8	20		F. pennsylvanica	2.52	14
2	Q. macrocarpa	4.4	30	left 10	Picea glauca	1.96	119
	F. pennsylvanica	2.6	64		Picea glauca	4.3	31
	Populus balsamifera	3.95	85		Picea glauca	2.1	128
	F. pennsylvanica	3.4	28		Picea glauca	3.12	128
3	Acer negundo	4.55	13	11			
	F. pennsylvanica	2.55	36				
	Ulmus americana	2.2	28				
	Picea glauca	1.7	105				
4	Picea glauca	3.2	51	12			
	Picea glauca	1.35	68				
	Ulmus americana	3.4	58				
	F. pennsylvanica	1.44	93				
5	Acer negundo	1.5	49	13			
	F. pennsylvanica	1.2	87				
	Acer negundo	3.45	70				
	Q. macrocarpa	3.5	23				
6	Acer negundo	3.6	44	14			
	U. americana	5.55	121				
	F. pennsylvanica	1.15	17				
	U. americana	1.63	14				
across river 7	U. americana	3.85	16	15			
	U. americana	2.91	103				
	F. pennsylvanica	2.2	63				
left	Acer negundo	1.6	101				
right 8	Acer negundo	2.9	92	16			
	Acer negundo	4.8	76				
	U. americana	2.7	18				
	F. pennsylvanica	2.66	23				

Quadrat Sheet

Observer: BEV HATHAWAY, ROSS THOMASSON

Vegetation: SHRUBS (T_2)

Date: JULY 12, 1984

Size and shape of quadrat 1m x 2m

Place: BROKENHEAD ECOLOGICAL RESERVE

Notes: eg. technique (cover, presence etc)

Species	Number of Quadrat																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
~~Bare ground~~																					
Rosa spp.	2	1																			
Fraxinus pennsylvanica	3	2		3						2	2		1								
Corylus cornuta	10	12	3	4	9			2						1							
Acer spicatum	7		5	2								8									
Quercus macrocarpa		1		1						1			2		3						
Acer negundo			1			1	3	2							1						
Ulmus americana			7			1				4				2							
Symphoricarpos albus				4											10						
Viburnum trilobum				2	2		2														
Prunus pennsylvanica				1				3													
Populus tremuloides						4		4													
Rubus idaeus						5				4											
Amelanchier alnifolia										3											
Crataegus rotundifolia											3										
Acer pennsylvanicum													9								

Quadrat Sheet

Observer: Bev Hathaway

Vegetation: Herbs

Date: June 27/84

Size and shape of quadrat 0.25 m²

Place: Wampum Ecological Reserve

Notes: eg. technique (cover, presence etc)

T1

Species	Number of Quadrat																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
~~Bare ground~~ litter	4	3	3	2	1	3	2	4	4	2	3	3	2	4	1	1	1	1	2	4	
F. virginiana	4		2	2			1		2				2		1		2	1	1	2	
Lathyrus venosus	1		2	1				1											1		
A. uva-ursi	2			1	5	3	5		2	4	3	3	2	2	2	2	4		4		
Grass	2	1	1	2			1		4	1						1	1	1		1	
Maianthemum canadense	1	2	1	3	2	2	2	1	1		2	5	2	2	1	1	2	1	1	2	
Pteridium aquilinum		3	4	4				5	2		5		3	3	3	3			5	4	
Sphagnum		3		4		2	1				2			2	4	5	1	4	1		
Rhus radicans			2	2																	
Gaultheria procumbens						2							1		1		2				
Linnaea borealis							2														
Senecio canus									2												
Galium boreale									1												
Lycopodium complanatum									2												
Campanula rotundifolia									1												
Cladonia spp.										4	1										
Aralia nudicaulis											2										
Epilobium angustifolium													2							2	
Pyrola asarifolia															2						
Smilacina stellata																		2		2	

Quadrat Sheet

Observer:

Date:

Place: WAMPUM ECOLOGICAL RESERVE

Vegetation: Herbs (cont'd)

Size and shape of quadrat

Notes: eg. technique (cover, presence etc)

T1 & T2

Species	Number of Quadrat																				
	21	22	23	24	25	26	27	28	29	30	31	32	13	14	15	16	17	18	19	20	Total
~~Ate ground~~ Litter		3	1	3	2	2	5	4		2	3	4									
Viola sp.												2									
Gaultheria p.	1																				
Sphagnum	4	2	3			2															
Grass	1	1			1	2		2	2		1	1									
. uva-ursi	4	1	4																		
U. canadense	1	1				2	1		1												
. virginiana				2	1	2			2	3	2										
Lathryus venosus	1			2	2			2		3											
P. aquilinum					4																
. angustifolium		1		2				3		3											
Smilacina stellata		2			4						2	3									
Rhus radicans				3							3										
P. asarifolia						2						1									
P. rotundifolia						1															
C. canadensis								3			2										
Lycopodium complanatum								2													
Linnaea borealis									4												
Anemone canadensis										2											
Sanicula marilandica											3	1									
Moss											2										
Urtica dioica											3										
Aralia nudicaulis								3	3		4	2									

Quadrat Sheet

Observer: B. Hathaway

Vegetation: Shrubs

Date: June 27/84

Size and shape of quadrat 1m x 2m

Place: Wampum E.R.

Notes: eg. technique (cover, presence etc) T1

Species	Number of Quadrat																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Rosa acicularis ~~leaf ground~~	1	1		4		1		2	5	1	2	6	2		1	2		4	1		
Lonicera glaucescens		15				2															
Corylus cornuta			1	3	4		4	7	1		2	1	3	2	1		2	2			
Prunus virginiana					2		4						1		1	1	2	2	1		
Rubus idaeus					1	1															
Vaccinium myrtilloides					2									12	17	7	6	8	1	3	
Amelanchier alnifolia						4		2		11	1	7		2	3		1	2	1	5	
Fraxinus nigra								3													
Viburnum trilobum									1										2		
Alnus crispa													7								
Pinus banksiana																	1				
Shepherdia c.																	3				

Quadrat Sheet

Observer: _____

Date: _____

Place: Wampum E.R.

Vegetation: Shrubs (cont'd).

Size and shape of quadrat _____

Notes: eg. technique (cover, presence etc)

T1 + T2

Species	Number of Quadrat																				
	21	22	23	24	25	26	27	28	29	30	31	32	~~13~~	~~14~~	15	16	17	18	19	20	Total
~~Bare ground~~																					
Rosa acicularis	1	2	4	1					7	10	1										
Lonicera glaucescens	11	1	3		3	3		5	15												
Corylus cornuta	1			2		11	18		6	3	10	21									
Vaccinium myrtilloides	7	11		4	4	1	1	4													
Amelanchier alnifolia		4	5	3	5			4		2											
P. virginiana					1																
Ribes spp					2																
P. tremuloides							2		1												
Rubus pubescens							1	5													
Salix sp.								2													
Rubus idaeus									3	5	2										
Crataegus sp.												1									

POINT QUARTER RECORD SHEET

Surveying Team- BEV HATHAWAY, ROSS THOMASSON

Site- WAMPUM ECOLOGICAL RESERVE

Date- JUNE 7/84

Soil Type-

Soil pH-

Conductivity-

TRANSECT T_1

Point	Tree species	(m.) Dist.	(cm.) circum.
right 1	Pinus banksiana	2.2	55
	P. banksiana	2.2	61
	P. banksiana	2.4	88
	P. banksiana	1.0	64
right 2	P. banksiana	2.1	65
	P. banksiana	4.2	59
	P. banksiana	1.73	61
(23)	P. banksiana	5.0	55
right 3	P. banksiana	2.7	77
	P. banksiana	1.98	53
	P. banksiana	4.2	58
	P. banksiana	3.2	51
left 4	P. banksiana	1.96	57
	P. banksiana	1.92	57
	P. banksiana	2.97	52
(15)	P. banksiana	1.77	80
right 5	P. banksiana	4.2	23
	P. banksiana	3.77	92
	P. banksiana	11.9	84
(15)	P. banksiana	5.75	88
left 6	P. banksiana	3.3	43
	P. banksiana	5.2	71
	P. banksiana	2.7	74
	P. banksiana	2.7	72
left 7	P. banksiana	5.3	100
	P. banksiana	1.2	79
	P. banksiana	6.7	85
(15)	P. banksiana	3.8	77
right 8	P. banksiana	7.1	60
	P. banksiana	7.45	53
	P. banksiana	3.5	62
(15)	P. banksiana	4.0	63

Point	Tree species	(m.) Dist.	(cm. circum
right 9	P. banksiana	5.45	90
	P. banksiana	2.9	71
	P. banksiana	3.1	78
(30)	P. banksiana	2.6	43
right 10	P. banksiana	2.25	61
	P. banksiana	3.1	105
	P. banksiana	2.6	104
	P. banksiana	2.9	48
left 11	P. banksiana	1.3	65
	Populus tremuloides	4.9	24
	Betula papyrifera	2.9	49
	P. banksiana	2.8	77
right 12	P. banksiana	2.6	98
	B. papyrifera	10.6	53
	P. banksiana	1.7	81
	P. banksiana	6.85	103
left 13	P. resinosa	5.3	73
	P. resinosa	2.9	104
	P. resinosa	2.9	92
	P. resinosa	6.4	93
right 14	P. banksiana	11.65	82
	B. papyrifera	1.75	16
	P. banksiana	3.05	75
	P. banksiana	5.2	117
left 15	P. tremuloides	2.1	21
	P. banksiana	2.6	119
	P. tremuloides	2.3	51
	P. resinosa	4.1	113
left 16	B. papyrifera	5.9	49
	P. resinosa	6.4	126
	P. banksiana	4.9	88
(30)	P. banksiana	3.4	81

POINT QUARTER RECORD SHEET

Site- Wampum T_1-cont'd.

Surveying Team-

Date-

Soil Type-

Soil pH-

Conductivity-

Point	Tree species	(m.) Dist.	(cm.) circum.	Point	Tree species	(m.) Dist.	(cm.) circum.
lt 1	P. banksiana	2.35	102	9			
	P. tremuloides	4.7	105				
	P. banksiana	10.3	95				
	P. tremuloides	2.1	92				
lt 2	P. resinosa	4.6	140	10			
	P. tremuloides	1.2	17				
	P. resinosa	2.4	142				
	P. resinosa	4.2	97				
(21) ft 3	P. resinosa	3.55	149	11			
	P. tremuloides	1.7	17				
	P. resinosa	4.65	132				
	P. resinosa	3.6	133				
ft 4	B. papyrifera	2.9	58	12			
	P. tremuloides	5.8	88				
	B. papyrifera	3.15	28				
	B. papyrifera	3.4	31				
ft 5	B. papyrifera	1.6	33	13			
	B. papyrifera	1.6	64				
	B. papyrifera	3.06	94				
	P. banksiana	2.6	80				
left. 6	P. banksiana	4.3	85	14			
	B. papyrifera	3.9	39				
	P. banksiana	2.0	91				
	B. papyrifera	6.0	60				
7				15			
8				16			

POINT QUARTER RECORD SHEET

Surveying Team- ROSS THOMASSON, BEV HATHAWAY

Site- WAMPUM ECOLOGICAL RESERVE

Date- JUNE 7/84 **Soil Type-**

Soil pH-

Conductivity-

Transect #2

Point	Tree species	(m.) Dist.	(cm.) circum.
left 1	Pinus resinosa	1.8	49
	Pinus banksiana	0.9	90
	P. banksiana	1.63	70
	P. resinosa	1.23	128
(30) right 2	P. banksiana	5.3	82
	P. resinosa	3.45	77
	P. resinosa	1.15	93
	P. resinosa	2.27	42
right 3	P. banksiana	2.62	89
	Betula papyrifera	3.34	84
	B. papyrifera	2.15	39
	P. banksiana	3.2	71
left 4	P. banksiana	3.2	61
	P. banksiana	1.37	64
	P. banksiana	1.75	96
	P. banksiana	1.4	86
left 5	P. banksiana	4.6	90
	P. banksiana	1.1	71
	P. banksiana	1.93	86
	P. banksiana	2.78	39
(16) left 6	P. banksiana	2.1	62
	P. banksiana	1.4	87
	P. banksiana	0.97	53
	P. banksiana	4.85	81
(27) right 7	P. banksiana	4.9	70
	P. banksiana	2.2	81
	P. banksiana	2.87	62
	P. banksiana	2.8	68
(30) left 8	P. banksiana	2.7	55
	P. banksiana	3.53	80
	B. papyrifera	4.5	53
	P. banksiana	1.9	80

Point	Tree species	(m.) Dist.	(cm. circum
left 9	P. banksiana	3.2	65
	B. papyrifera	3.66	50
	B. papyrifera	3.2	16
	P. banksiana	4.1	94
left 10	B. papyrifera	3.8	80
	P. banksiana	3.25	90
	Populus tremuloides	4.1	36
	P. banksiana	4.9	64
(36) left 11	P. banksiana	1.4	53
	B. papyrifera	1.6	22
	P banksiana	3.1	63
	P. banksiana	4.3	79
right 12	P. banksiana	1.1	58
	P. banksiana	6.7	92
	P. banksiana	2.3	79
	P. banksiana	3.75	49
left 13	P. banksiana	2.6	77
	P. banksiana	1.2	97
	P. banksiana	2.7	73
	P banksiana	5.4	75
14			
15			
16			

Quadrat Sheet

Observer: Bev Hathaway

Date: July 9/84

Place: Pocock Lake Ecological Reserve

Vegetation: Herbs (T_2 to lake)

Size and shape of quadrat: 0.25 m^2

Notes: eg. technique (cover, presence etc)

Species	Number of Quadrat 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
LITTER ~~Bare ground~~	4		5	1				1		1	3	3	1		1	4					
Iris versicolor	2				3																
Asclepias incarnata	2											2					2				
Matteucia struthiopteris	3											2		4	1						
Grasses	1					1			1												
Sisyrinchium montanum		1											1								
Carex spp.	3	5																			
Sphagnum spp.			3	5	5	4	5	5	5	4		1	1		3						
Cornus canadensis				1					2		2	2	1	1	2						
Corallorhiza maculata						2															
Chimaphila borealis						2					1	2	4	1				3			
Pyrola asarifolia								2			3										
Trientalis borealis								1				1									
Mitella nuda									2												
Cypripedium reginae											3	3	4								
Linnaea borealis											2	4									
Spiranthes romanzoffiana												2									
Moneses uniflora													1								
Galium boreale													1								
Cypripedium calceolus														2							
Fragaria virginiana														2							
Smilax herbacea															3						
Aquilegia canadensis																2				2	

Quadrat Sheet

Observer: _____ **Vegetation:** Herbs (cont'd)

Date: _____ **Size and shape of quadrat** _____

Place: Pocock Lake Ecological Reserve **Notes:** eg. technique (cover, presence etc)

Species	Number of Quadrat																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	~~20~~	
~~Bare Ground~~ LITTER																		2	3		
Caltha palustris															4						
Asarum canadense																	3		3		
Petasites palmatus																	3	3			
Pteridium aquilinum																	4	5			
Epilobium angustifolium																	2		1		
Rhus radicans																	2		2		
Sanicula marilandica																			3		
Aralia nudicaulis																			4		

Quadrat Sheet

Observer: Bev Hathaway

Vegetation: Shrubs (T_2 to lake)

Date: July 9/84

Size and shape of quadrat 1m x 2m

Place: Pocock Lake Ecological Reserve

Notes: eg. technique (cover, presence etc)

Species	Number of Quadrat																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Toto
Salix spp.	6																				
Potentilla fruticosa	4	18																			
Larix laricina	1																				
Thuja occidentalis			6	3	1		1	6	1	1		1									
Sedum groenlandicum				9	16	27	32	5	7	8	8	10	12	3							
Corylus cornuta				2					2	3	1		3	2	1						
Rubus pubescens								5	4	15	10	2	6	1							
Rosa spp.													1								
Amelanchier alnifolia													3	2	3						
Alnus crispa														7							
Shepherdia canadense														2							
Acer spicatum														3	4						

1 2 (to Lake)

POINT QUARTER RECORD SHEET

Surveying Team- B. HATHAWAY, R. THOMASSON

Site- POCOCK LAKE ECOLOGICAL RESERVE

Date- JUNE 14/84 **Soil Type-**

Soil pH-

Conductivity-

Point	Tree species	(m.) Dist.	(cm.) circum.	Point	Tree species	(m.) Dist.	(cm.) circum
1	Larix laricina	1.4	33	9	T. occidentalis	4.0	151
	L. laricina	0.85	31		Picea mariana	6.8	34
	L. laricina	2.4	42		T. occidentalis	3.0	98
	Thuja occidentalis	0.9	11		T. occidentalis	5.2	41
2	T. occidentalis	5.05	17	10	Picea mariana	3.8	37
	Picea mariana	2.5	33		T. occidentalis	3.5	87
	T. occidentalis	3.5	84		Picea mariana	3.6	61
	T. occidentalis	2.7	53		Picea mariana	2.1	62
3	T. occidentalis	1.6	29	11	P. mariana	1.8	53
	T. occidentalis	1.0	30		P. mariana	3.9	37
	T. occidentalis	5.0	40		P. mariana	1.9	57
	T. occidentalis	3.9	64		T. occidentalis	3.4	17
4	T. occidentalis	2.0	24	12	Picia glauca	6.8	46
	T. occidentalis	3.0	18		Betula papyrifera	16.0	90
	Picea mariana	1.2	35		B. papyrifera	2.8	61
	T. occidentalis	2.0	28		B. papyrifera	3.2	75
5	Picia mariana	0.8	26	13	T. occidentalis	1.9	62
	T. occidentalis	1.75	22		T. occidentalis	6.5	127
	Picea mariana	2.7	44		B. papyrifera	8.4	89
	Picea mariana	0.6	78		P. mariana	5.7	61
6	T. occidentalis	3.0	60	14	B. papyrifera	6.4	29
	T. occidentalis	2.0	17		Pinus banksiana	7.45	91
	T. occidentalis	5.7	116		B. papyrifera	2.9	88
	T. occidentalis	3.4	20		B. papyrifera	3.6	46
7	T. occidentalis	5.6	84	15			
	T. occidentalis	3.4	19				
	T. occidentalis	3.8	79				
	T. occidentalis	5.7	104				
8	T. occidentalis	1.8	82	16			
	Picea mariana	6.85	45				
	T. occidentalis	6.5	91				
	T. occidentalis	4.0	126				

Quadrat Sheet

Observer: BEV HATHAWAY

Date: JUNE 29, 1984

Place: POCOCK LAKE ECOLOGICAL RESERVE

Vegetation: HERBS

Size and shape of quadrat: 0.25 m²

Notes: eg. technique (cover, presence etc)

Species	Number of Quadrat																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
~~Bare ground~~ LITTER	3	1	4	1	3	3	1	1	3	3	1	2	2								
Bracken fern	5											3	5	3							
Sphagnum	1			1						2											
False Solomon's seal		1	1	2	2	2	4			2		2									
Maianthemum canadense		1	1	3	3	1	3					3	2	2							
Lathyrus venosus		2	2											2							
Bearberry		4		1	1	3		1	3	2	2	2	2								
Grass	1	1	3	1	1	1	3	4	1	4	1	1	1	2							
Gaultheria procumbens		1									1										
Campanula rotundifolia			1		1					2	2										
Galium boreale					1	2		2	1	2				2							
Thalictrum dasycarpum				3										2							
Sanicula marilandica				2								2									
Fragaria virginiana					1				1												
Anemone cylindrica					1	2	1		2												
Asarum canadense							1														
Apocynum androsaemifolium								3	2	2											
Rhus radicans								3													
Cladonia spp.									1	2	2										

Quadrat Sheet

Observer: BEV HATHAWAY

Vegetation: SHRUBS

Date: JUNE 29/84

Size and shape of quadrat 1m x 2m

Place: POCOCK LAKE ECOLOGICAL RESERVE

Notes: eg. technique (cover, presence etc)

Species	Number of Quadrat																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Twining Honeysuckle ~~bare ground~~	14	1		6	1									7							
Blueberry	5	10		1	1	9	8		5	8	8	13	15								
Corylus c.	2		2	7	2	1					2			1							
Prunus pennsylvanica	2						2		4		2	1		2							
Amelanchier alnifolia		17			6		4	2		5		1									
Rosa spp.			1	3	9			5	6	3			2	3							
Viburnum trilobum					9																
Oak seedling							1														
Ceanothus ovatus		2					1		8	2											
Pinus banksiana											1										
Symphoricarpos albus													4	5							

POINT QUARTER RECORD SHEET

Surveying Team- BEV HATHAWAY, ROSS THOMASSON

Site- POCOCK LAKE ECOLOGICAL RESE

Date- JUNE 14/84 **Soil Type-**

Soil pH-

Conductivity-

TRANSECT 1.

Point	Tree species	(m.) Dist.	(cm.) circum.	Point	Tree species	(m.) Dist.	(cm. circu
1	Pinus banksiana	2.0	71	9			
	P. banksiana	1.4	92				
	P. banksiana	1.45	42				
	Populus tremuloides	1.65	36				
2	P. banksiana	4.9	36	10			
	P. banksiana	3.4	54				
	P. banksiana	9.3	73				
	P. banksiana	7.3	21				
3	P. banksiana	3.35	53	11			
	P. banksiana	0.98	63				
	P. banksiana	3.5	69				
	P. banksiana	1.0	45				
4	Betula papyrifera	9.0	19	12			
	P. banksiana	4.1	81				
	P. banksiana	9.0	70				
	P. banksiana	2.0	69				
5	P. banksiana	1.6	62	13			
	P. banksiana	2.3	56				
	P. banksiana	4.9	68				
	P. banksiana	1.5	57				
6	P. banksiana	2.0	75	14			
	P. banksiana	2.2	56				
	P. banksiana	3.0	75				
	P. banksiana	3.3	77				
7	P. banksiana	2.45	122	15			
	P. banksiana	7.0	75				
	P. banksiana	4.2	52				
	P. banksiana	5.9	83				
8				16			

POINT QUARTER RECORD SHEET

Surveying Team- R. THOMASSON, B. HATHAWAY

Site- POCOCK LAKE ECOLOGICAL RES

Date- JUNE 14/84

Soil Type-

Soil pH-

Conductivity-

TRANSECT 2 (hill)

Point	Tree species	(m.) Dist.	(cm.) circum.	Point	Tree species	(m.) Dist.	(cm.) circum.
1	Pinus banksiana	13.5	64	9			
	P. banksiana	4.8	78				
	P. banksiana	1.3	93				
	P. banksiana	5.45	71				
2	P. banksiana	7.9	54	10			
	P. banksiana	1.2	45				
	P. banksiana	7.6	63				
	P. banksiana	3.7	51				
3	P. banksiana	6.7	32	11			
	P. banksiana	2.4	48				
	P. banksiana	3.6	61				
	P. banksiana	5.5	69				
4	P. banksiana	3.8	69	12			
	P. banksiana	4.1	60				
	P. banksiana	11.7	16				
	P. banksiana	9.7	60				
5	P. banksiana	5.0	70	13			
	P banksiana	6.1	82				
	P. banksiana	2.3	62				
	P. banksiana	1.75	42				
6	P. banksiana	2.0	47	14			
	P. banksiana	6.0	47				
	P. banksiana	6.5	65				
	P. banksiana	3.4	82				
7	P. banksiana	9.55	61	15			
	P. banksiana	9.5	61				
	P. banksiana	9.5	60				
	Betula papyrifera	7.9	69				
8	B. papyrifera	6.8	24	16			
	P. banksiana	7.6	70				
	B. papyrifera	4.7	57				
	B. papyrifera	3.5	33				

POINT QUARTER RECORD SHEET

Surveying Team- B. HATHAWAY, R. THOMASSON

Site- POCOCK LAKE ECOLOGICAL RESERVE

Date-

Soil Type-

Soil pH-

Conductivity-

TRANSECT 3

Point	Tree species	(m.) Dist.	(cm.) circum.	Point	Tree species	(m.) Dist.	(cm.) circum.
1	Pinus banksiana	2.9	66	9			
	P. banksiana	2.8	71				
	P. banksiana	5.5	65				
	P. banksiana	6.0	47				
2	P. banksiana	2.3	56	10			
	P. banksiana	5.5	66				
	P. banksiana	7.2	72				
	P. banksiana	9.4	51				
3	P. banksiana	2.9	28	11			
	P. banksiana	1.3	40				
	P. banksiana	7.2	54				
	P. banksiana	4.75	55				
4	P. banksiana	5.6	70	12			
	P. banksiana	3.7	81				
	P. banksiana	1.9	73				
	P. banksiana	2.6	64				
5	Betula papyrifera	5.8	73	13			
	P. banksiana	8.2	63				
	B. papyrifera	9.3	72				
	B. papyrifera	3.4	51				
6				14			
7				15			
8				16			